



by

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DESCRIPTION OF MAP UNITS

Qf	Artificial-fill deposits - Lake Bonneville gravels used as a thin base for a landing strip west of the Grayback Hills. Deposits are less than 1 foot (0.3 m) thick.
Qes	Silica-dune deposits - Sand-sized quartz grains deposited as dunes on the east slope of the Grayback Hills. Probably locally reworked from lacustrine and alluvial sediments. The dunes are as high as 10 feet (3m).
Qeg	Gypsum-dune deposits - Primarily sand-sized gypsum grains deposited as dunes in the east margin of extensive mud flats. The gypsum probably was derived both from the erosion of efflorescent mud flat salts and in-place reworking of lacustrine beach deposits at the 4,230-foot (1,289 m) level of the Gilbert shoreline. Dunes form north-south linear ridges up to 30 feet (9 m) high.
Qal	Alluvial-channel and -floodplain deposits - Fine-grained alluvium with thin gravel layers and lenses, deposited in a channel and floodplain near the northeast end of the Grayback Hills after the regression of Lake Bonneville from the Provo shoreline. Includes some alluvially reworked colluvium deposited on piedmont slopes. Deposits are generally less than 10 feet (3 m) thick.
Qaf	Alluvial-fan deposits - Coarse- to fine-grained alluvium, mixed with debris-flow sediments, deposited on piedmont slopes after regression of Lake Bonneville from the Provo shoreline. Generally finer grained in the distal portion of the fans, where locally mixed with lacustrine sediments. Deposits are generally less than 10 feet (3 m) thick.
Qpm	Playa-mud deposits - Poorly sorted clay and silt and small amounts of sand, deposited within and adjacent to gypsum dunes west of the Grayback Hills. Deposits are generally less than 10 feet (3 m) thick.
Qls	Lacustrine sand - Fine- to medium-grained, silty sand deposited in bars, spits, tombolos, and beaches near the Gilbert shoreline. Locally contains pebbly layers and lenses and thin clayey and marly interbeds. The unit may be as much as 30 feet (9 m) thick.
Qlm	Lacustrine marl - Very fine-grained white to gray marl and alluvially reworked sandy marl and marly sand. Outcrops occur near the crest and along the eastern margin of the Grayback Hills. Locally contains ostracodes and gastropods. Deposits are generally less than 6 feet (2 m) thick.
Qli	Lacustrine lagoon deposits - Silt, clay, marl, and minor sand that fill lagoons behind shoreline gravel bars along the flanks of the Grayback Hills. Deposits are generally less than 10 feet (3 m) thick.
Qlg	Lacustrine gravel - Sandy gravel deposited in beaches and spits on the margins of the Grayback Hills, as a tombolo connecting Pinky Ridge to the main portion of the hills, and as barrier bars adjacent to lagoons near the crest of the hills. Bars and spits are associated with the Gilbert and Stansbury shorelines, but gravel is common between these levels and above the Stansbury shoreline. Thin, unmappable beds of lacustrine tufa, draped on bedrock units, are included. Gravels are typically well rounded and locally intertongue with volcanic talus at unmappable scales. The unit may be up to 30 feet (9 m) thick.
Qlg/Ti	Lacustrine gravel overlying trachyandesite lava - Thin deposits of gravel, mostly composed of reworked volcanic talus, resting on trachyandesite lava flows beneath the flanks of the Grayback Hills.
Qlg/Td	Lacustrine gravel overlying Dinwoody Formation - Thin deposits of gravel, mostly composed of small angular fragments of the Dinwoody Formation, lying on the Dinwoody Formation beneath a gravel bar connecting the central part of Thumb Ridge with its south margin.
Qlf	Lacustrine fine-grained deposits - Silt, clay, and lesser amounts of fine sand and marl deposited on the basin floor east of the mud flats. Typically contains low-relief, crescentic features known as desert ripples. These deposits are generally less than 30 feet (9 m) thick.
Qlc	Lacustrine clay - Typically consists of thin-bedded to laminated clay deposited in mud flats west of the Grayback Hills. Includes small amounts of interbedded fine sand, silt, and marl. Commonly overlain by a thin crust of efflorescing salts or a thin layer of sand- and silt-sized gypsum particles, particularly in areas adjacent to gypsum dunes. The unit generally less than 10 feet (3 m) thick.
Qla	Undifferentiated lacustrine and alluvial deposits - Fine- to coarse-grained sediments in the piedmont. Coarser in middle and upper piedmont areas. Locally contains colluvium which intertongues with the lacustrine and alluvial material at unmappable scales. The unit is generally less than 10 feet (3 m) thick.
Tt	Trachyandesite lava flows - Grayish-black, olive-black, olive-gray, dark-gray, medium-dark-gray and grayish-brown fresh; grayish-black, grayish-brown, moderate-yellowish-brown, and brownish-gray- weathering trachyandesite that is porphyritic with an average of 15 percent phenocrysts typically of calcic plagioclase and pyroxene. Matrix, commonly trachytic, contains phenocryst minerals plus as much as 20 percent glass. (Parallel to conchoidal fracturing or jointing.) Some vesicular textures, generally blocky weathering. Dated at 39.1 ± 1.0 and 38.5 ± 0.6 Ma by K-Ar methods. Individual flows are 35 feet (15 m) thick or less.

Tsd	Volcaniclastic rocks - Interbedded light-gray tuffaceous conglomeratic sandstone and dacite tuff. Tuffaceous conglomeratic sandstone (80 percent of unit) composed of fine sand- to cobble-sized clasts; coarser clasts consist of silty or sandy limestone, siltstone, sandstone, and chert; finer grained constituents are of broken volcanic glass shards, grains of mica, mafic minerals, quartz, feldspar, and bits of siltstone, sandstone, and chert. Dacite tuff (20 percent) contains phenocrysts of mica, quartz, and feldspar in a devitrified matrix. Dated at 38.6 ± 1.0 Ma by K-Ar method and 35.52 ± 0.38 Ma by weighted age. Incomplete exposures are more than 300 feet (90 m) thick.
Ttu	Upper Thaynes Formation - Gray limestone, weathers brown where silty and sandy, thin- to thick-bedded, locally fossiliferous containing cephalopods (<i>Prohungarites</i> , <i>Keyserlingites</i> , <i>Stachites</i>) , pelecypods (<i>Bakevillia</i> , <i>Eumorphotis</i> , <i>Claraia</i> , <i>Monotis</i> , <i>Nuculana</i> , <i>Unionites</i> , <i>Neoschizodus</i> ?), brachiopods (<i>Lingula</i>) , conodonts (<i>Neospathodus</i>), and other fossil debris (crinoid columnals, fish teeth, shark denticles, scaphopods?). Incomplete exposures are more than 220 feet (67 m) thick.
Ttl	Lower Thaynes Formation - Gray, ledge-forming limestone, thin- to thick-bedded porous; and locally fossiliferous, containing conodonts (<i>Ellisonia</i> , <i>Platyvillosus</i> , <i>Neospathodus</i>), microgastropods (<i>Cylindrobullina</i> , <i>Naticopsis</i>), crinoid columnals, shark denticles, fish teeth, and echinoid fragments. Incomplete exposures are more than 240 feet (73 m) thick.
Td	Dinwoody Formation - Interbedded shale, sandstone, and silty and sandy limestone; shale is yellowish-gray, grayish-yellow, and light-olive-gray; limestone is grayish-red, light-olive-gray, and medium-gray; shaly to medium bedded; slope former, lower half very poorly exposed; contains sporadic poorly preserved fossils. The complete unit is 1,280 feet (390 m) thick.
Pge	Gerster Formation - Limestone and chert; limestone gray and light-gray-weathering; fine- to coarse-grained crystalline; medium-bedded to massive; resistant and ledge forming; hackly weathering; light-blue-gray chert present and nodules, blebs, stringers, and beds that weather to produce a brown rind; fossiliferous containing productid and spiriferid brachiopods, shell fragments, and crinoid columnals. The complete unit is 310 feet (95 m) thick on Thumb Ridge.
Pm	Murdock Mountain Formation - Interbedded light-gray, blue-gray, and gray-tan, brown-weathering, mostly medium-bedded and nodular chert and light-gray cherty dolomite and limestone; forms subdued and rubbly ledges; locally contains poorly preserved fossil debris. More than 500 feet (150 m) of the unit is exposed, total thickness estimated at 1,650 feet (503 m).
Ppm	Meade Peak Member of the Phosphoria Formation - in cross section only
Pg?	Grandeur? Formation - Interbedded light-gray-weathering sandy limestone, dolomitic limestone, and dolomite; chert common as nodules and blebs, as well as in sporadic thin beds. Generally resistant, ledge-forming, and hackly weathering. More than 500 feet of the unit (150 m) is exposed.

MAP SYMBOLS

	Contact, dashed where approximate
	High-angle fault, dashed where approximately located, dotted where concealed, queried where conjectural.
	Anticline - showing trace of axial plane and plunge of axis. Dotted where projected beneath surficial deposits.
	Syncline - showing trace of axial plane. Dotted where projected beneath surficial deposits.
	Strike and dip of bedding
	Horizontal bedding
	Strike of vertical bedding
	Strike and dip of overturned bedding
	G — G Gilbert shoreline of the Great Salt Lake
	S — S Stansbury shoreline of Lake Bonneville
	Gravel pits, circled numbers designate pits described in table 3.
	• 3 Sample locations of materials collected for geochemical analyses reported in table 1.
	• B Sample locations of materials collected for radiometric dating reported in table 2.

PERIOD	EPOCH	FORMATION OR MEMBER	SYMBOLS	THICKNESS FEET (M)	LITHOLOGY
QUATERNARY	Holocene	Surficial deposits	Qf, Qal, Qaf, Qes, Qeg, Qpm, Qla	0 - 50 (0-15)	
	Pleistocene	Mostly Lake Bonneville deposits	Qla, Qlf, Qlc, Qlg, Qls, Qli, Qlm	0 - 50+ (0-15+)	
TERTIARY	Eocene or Oligocene	Trachyandesite lava flows	Tt	35+ (11+)	
		Volcaniclastic rocks	Tsd	307+ (94+)	
TRIASSIC	Lower	Thaynes Formation	Ttu	220+ (67+)	
			Ttl	240+ (73+)	
			Td	1280 (390)	
		Dinwoody Formation	Td	1280 (390)	
PERMIAN	Guadalupian	Gerster Formation	Pge	310 (95)	
		Murdock Mountain Formation	Pm	500+ (150+)	
	Leonardian			total estimated 1650 (503)	
		Phosphoria Formation	Ppm	230? (70?)	
		Grandeur? Formation	Pg ?	500+ (150+)	

CORRELATION OF MAP UNITS

